



## A meta-analysis of correlations between depression and first person singular pronoun use



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### ABSTRACT

Depression is a burden. We discuss how theories, identification, assessment, and treatment of depression are at least partially tied to the correlation between first person singular pronoun use and individual differences in depression. We conducted a meta-analysis ( $k = 21$ ,  $N = 3758$ ) of these correlations, including numerous unpublished correlations from the file drawer. Our fixed effects analysis revealed a small correlation ( $r = 0.13$ , 95% CI = [0.10–0.16]) by modern standards. The correlation was not moderated by gender, nor by whether the effect had been published. These results more firmly establish first person singular pronoun use as a linguistic marker of depression—a marker that appears to be useful across demographic lines.

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Depression is a massive burden to society and to the individuals it afflicts (Ferrari et al., 2013). Accordingly, it is important to be able to (a) understand depression through accurate theories, (b) identify it, (c) assess it, and (d) treat it effectively. In terms of theory, one idea that emerged in the literature is that depression involves intense self-focus (Ingram & Smith, 1984; Pyszczynski & Greenberg, 1987; Smith & Greenberg, 1981). In terms of identification—and to operationalize self-focus—it has been proposed that researchers study first-person singular pronouns (Stirman & Pennebaker, 2001). In terms of assessment, Pennebaker's group found that depression is linked to using more first-person singular pronouns (Rude, Gortner, & Pennebaker, 2004); this effect has been viewed as a fundamental linguistic marker of depression (Ireland & Mehl, 2014). To treat depression, researchers have begun tracking first-person singular pronouns and tried to minimize self-focused rumination (Kross & Ayduk, 2008; Kross et al., 2014; Zimmermann, Brockmeyer, Hunn, Schauenburg, & Wolf, 2016). Thus, arguably, one brick in the foundation of the depression literature is the effect linking first person singular pronoun use to depression. In the paragraphs that follow, we review a key theory of depression, and then we turn to how personal pronouns have emerged as a linguistic marker of depression; then, we consider personal pronouns as a utility for assessment purposes and finally

turn to treatments that have been created based on this correlation between depression and first-person singular pronouns.

In terms of theory, in the early 1980s, it was shown that depression was linked to self-focused attention (Ingram & Smith, 1984; Smith & Greenberg, 1981). Building on this literature, Pyszczynski and Greenberg (1987) posited that the reason for this association is primarily because people who are depressed tend to perseverate on self-relevant information (for review of perseveration, see: Demakis, 2003; Sorg, Vögele, Furka, & Meyer, 2012). Perseveration is a form of repetitive thinking (Ehring et al., 2011); it can be neutral (i.e., reflection) or negative (i.e., brooding [about the past] or worrying [about the future]). One theory is that perseveration is caused in part by a thwarted goal (Pyszczynski & Greenberg, 1987). For instance, if a person is trying to get a job, and cannot get one, then the person may perseverate on the discrepancy between one's current self and one's desired self (Higgins, 1987; Treynor, Gonzalez, & Nolen-Hoeksema, 2003; Wicklund, 1975). This perseveration may constitute an attempt to figure out how to reduce the discrepancy (Carver & Scheier, 1981). Because non-depressed people are not coping with thwarted goals, or because they shift priorities to meet other life goals when indeed goals have been thwarted, in theory they do not focus on themselves as much (Pyszczynski & Greenberg, 1987); they do not get stuck in a cycle of self-focused attention. Thus, at the population level, across individuals varying in depression levels, this manifests in a positive correlation between self-focus and depression.

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The idea that depressed individuals tend to focus on themselves can be explored with linguistic analysis—such as by examining whether people who are depressed tend to talk about themselves more frequently. At the time the hypothesis emerged, however, there was not a suitable linguistic analytic system in psychology for large scale linguistic projects (but see: Bucci & Freedman, 1981). In a major advance, Pennebaker and colleagues created the LIWC (Pennebaker, Francis, & Booth, 2001). This linguistic system counts how frequently people use words in a number of categories. For instance, the 2001 variant of LIWC captures first person singular pronouns in one category. It includes the following words: *I, I'd, I'll, I'm, I've, me, mine, my, and myself*. This software development set the stage for a linguistic analysis of the idea that self-focus is common among people who are depressed. In brief, some studies found the effect (e.g., Rude et al., 2004), whereas others did not (e.g., Molendijk et al., 2010).

The first person singular pronoun effect is also relevant to the assessment of depression. In the information age, it has become possible to assess individual differences via digital footprints people leave on social media and blogging sites such as Facebook (Back et al., 2010; Buffardi & Campbell, 2008; Kern et al., 2014; Weidman et al., 2012; Youyou, Kosinski, & Stillwell, 2015) and Twitter (Coppersmith, Dredze, & Harman, 2014), and language is one important kind of footprint people leave behind (Kern et al., 2014; Schwartz et al., 2013; Yarkoni, 2010). Thus, it makes sense to use language as a marker of whether people are depressed (Coppersmith et al., 2014). This has opened up a new medium to identify and catch people who are potentially depressed. One of the most prominent effects in this literature is the link between first person singular pronouns and depression. On these grounds, it is important to identify the strength of the effect.

Last but not least, this effect is starting to become potentially important in the treatment literature. On the grounds that self-focused attention is manifest in first person singular pronoun use, it makes sense that minimizing first person singular pronoun use has the potential to decrease self-focus and perhaps down-regulate depressive symptoms and other tightly related internalizing problems. In short, persuading people to use fewer first person singular pronouns could alleviate some of the effects of depression and negative emotion more generally. This reasoning has been used in a few budding programs of research (Kross & Ayduk, 2008, 2011; Nook, Shchleider, & Somerville, in press; Park, Ayduk, & Kross, 2016; Zimmermann et al., 2016); indeed some of these articles involve studies that explicitly manipulate pronoun use (Kross et al., 2014) and identify first person singular pronoun use as one key mechanism of action in emotion regulation (Park et al., 2016). For these programs of research, it is important to know the magnitude of the effect—and also to find out for whom using first person singular pronouns may be most troublesome.

Given the implications for theory, assessment, and treatment, the time has come to integrate this research quantitatively. It would be helpful to be confident in the magnitude of the effect—and, at an even more basic level, to more firmly establish whether this effect is real. Accordingly, the goal of the current study is to conduct a meta-analysis of the extant literature as well as the unpublished literature regarding the correlations between depression and first person singular pronoun use. This will help establish whether publication bias exists in this literature.

In addition, we examine whether there is significant variability among the effects. We also explore a few moderators of this effect, in an attempt to identify boundary conditions. This has the potential to point the way to the subpopulations that would most benefit from interventions that are grounded on this effect—or establish that first person singular pronoun use is a robust marker across demographic lines. Of particular interest is whether the association between first person singular pronoun use and depression is larger

among women. Indeed, previous research by Fast and Funder (2010) indicated that first person singular pronoun use is more reflective of depression among women than among men—a finding that appears to be robust in the clinical psychology literature (Lyubomirsky, Layous, Chancellor, & Nelson, 2015; Nolen-Hoeksema, 1987; Nolen-Hoeksema, Larson, & Grayson, 1999). Thus, one goal of this meta-analysis is to determine whether first person singular pronoun use is more reflective of depression among women than among men.

Finally, as part of the moderation analysis, we aim to test the hypothesis that the link between first person singular pronoun use and depression varies as a function of task characteristics. We are especially interested in the link varying due to the public versus private nature of the task. Previous work has shown that the link is more evident among people in private settings (e.g., journals), rather than public ones (Rodriguez, Holleran, & Mehl, 2010). Additionally, we test the hypothesis that the effect varies due to the language task being written versus spoken.

In summary, we have the following goals for this meta-analysis: (a) to test the hypothesis that there is a positive correlation between depression and first person singular pronoun use; (b) to verify that the effect is not due to publication bias; (c) to explore whether there is significant variability among the effects from the studies collected and, if so, to model that variability; (d) to test hypotheses about demographic characteristics as moderators, especially gender (Fast & Funder, 2010); and (e) to test whether task characteristics moderate the effect, especially whether the task is public versus private (Rodriguez et al., 2010).

## 1. Method

### 1.1. Inclusion and exclusion of studies

Papers were included in the meta-analysis if (a) they included a correlation between depression and first-person singular pronoun usage as measured by LIWC, and (b) the study used a widely accepted assessment of depression such as the Beck Depression Inventory—II (Beck, Steer, & Brown, 1996). Table 1 lists the sample size for each study, the language tasks used, the depression assessments used in each study (all of which were continuous), and the mean age of participants.

### 1.2. Search strategy

We found relevant articles by conducting a carefully executed multi-step process. In the first step, we used the Web of Science database. We used two pairs of keywords in the search field including: *depress\** AND *pronoun*; *depress\** AND *“linguistic style”*. Web of Science yielded 30 potentially relevant articles, of which three were ultimately included (Dunnack & Park, 2009; Molendijk et al., 2010; Zimmermann, Wolf, Bock, Peham, & Benecke, 2013). The second step used Google Scholar as a supplement to the Web of Science database. When using the key words *depress\** and *“linguistic style”*, Google Scholar yielded 1170 potentially relevant articles, of which nine were ultimately included (Bernard, Baddeley, Rodriguez, & Burke, 2016; Castorena, 2012; Fast & Funder, 2010; Jarrold et al., 2011; Mehl, 2006; Rodriguez et al., 2010; Sanders, 2013; Van der Zanden et al., 2014; Zimmermann et al., 2016). The Google Scholar search for *depress\** and *pronoun*, however, returned over 17,000 potentially relevant articles. Looking through these was not feasible in a timely manner. Therefore, a more tailored search using the keywords *depress\** and *“first person singular pronoun”* was used. This process yielded 562 potentially relevant articles, which were thoroughly searched; all of the pertinent articles that were captured by this process had

**Table 1**  
Study, sample size (N), language task descriptions, depression measures, and mean age for each sample.

Study	N	Language task(s)	Depression measure(s)	Mean age
Bernard et al. (2015)	136	Write for 20 min about experiences since coming to college	CES-D	18.80
Castorena (2012)	105	Audio stream of consciousness about marital separation	BDI-II	40.40
Dunnack and Park (2009)	120	Journal about a serious loss	CES-D	n/a
Fast and Funder (2010)	181	Interviewed by clinician	BDI-II and the Brief Psychiatric Rating Scale	n/a
Holtzman (unpublished, 2014)	82	Interview with psychologist: life story; high point; low point; turning point	CES-D	19.69
Jarrod et al. (2011)	26	Structured interviews	CES-D	69.80
Klibert and Holtzman (unpublished, 2016)	211	Written stream of consciousness	CES-D	19.67
Kosinski & Stillwell (unpublished, 2016)	966	Facebook status updates	CES-D	26.65
Mehl (2006)	96	Audio from electronically activated recorder	BDI-Short	18.70
Molendijk et al. (2010)	412	Written essay about one's life	Symptom Check List-90: Depression Scale	37.90
Nook et al. (in press) Study 1a	107	Writing in response to neutral images	BDI	35.77
Nook et al. (in press) Study 1b	110	Writing in response to neutral images	BDI	36.53
Robbins (unpublished, 2012)	103	Conversations captured by EAR among couples in which the woman has a breast cancer diagnosis	CES-D	57.94
Rodriguez et al. (2010)	57	Personal diaries and online blogs	BDI	18.70
Sanders (2013)	34	Writing about a personal life experience	BDI-II	22.82
Sherman (unpublished, 2016)	287	Five minute interviews about one's personality	BDI-II	21.03
Tackman et al. (unpublished, 2016)	133	Spoke into video recorder about relationship separation	CES-D	43.13
Van der Zanden et al. (2014)	234	Written responses to (a) why one is applying to Master Your Mood; (b) personal problems	CES-D	20.00
Vazire et al. (unpublished, 2016)	211	Audio from Electronically Activated Recorder	CES-D	19.16
Zimmermann et al. (2013)	118	Semi-structured interview	BDI	32.80
Zimmermann et al. (2016)	29	Semi-structured interview	BDI	38.50

already been found in prior searches. The third step involved contacting scholars via a list serve in an attempt to find unpublished studies and studies we might have missed; this is important mainly because it allows us to determine whether publication bias is present. Five scholars responded with pertinent results, one of whom (Nook et al., in press) had two relevant studies. Thus, this method produced six additional studies (Nook et al., in press; Robbins, unpublished data, 2012; Tackman, Mehl, Sbarra, & Bootzin, unpublished data, 2016; Sherman, unpublished data, 2016; Vazire et al., unpublished data, 2016). The fourth step was to include two additional unpublished data sets that the second author had on file (Holtzman, unpublished data, 2014; Klibert & Holtzman, unpublished data, 2016). The fifth step was to contact the creators of MyPersonality.org to solicit data; the creators agreed to the inclusion of their unpublished results (Kosinski & Stillwell, unpublished data, 2016). All in all, there were a total of 3758 participants in the 21 studies listed in Fig. 1.

### 1.3. Quantitative plan

A key goal of ours was to find one effect size in each of the 21 studies. However, five of the studies yielded multiple effects that had to be collapsed across groups. Where appropriate, we ran the Fisher's  $r$ -to- $z$  transformation, averaged them, and then back transformed the result into the correlation metric. The following studies included multiple effects: Dunnack and Park (2009) reported the correlation between depression and I-use ( $r = 0.29$ ) separately from the correlation between depression and all other first person singular pronouns ( $r = 0.05$ ); thus, they were collapsed. In the Fast and Funder (2010) study, there were four results reported: the correlation between first person pronoun use and depression for self-reports by men in the study ( $r = 0.17$ ), for professional ratings about men ( $r = -0.04$ ), for self-reports by women in the study ( $r = 0.23$ ) and for professional ratings about women ( $r = 0.36$ ). For men, we collapsed the correlations for self-reports and professional ratings; we did the same for women. This resulted in two correla-

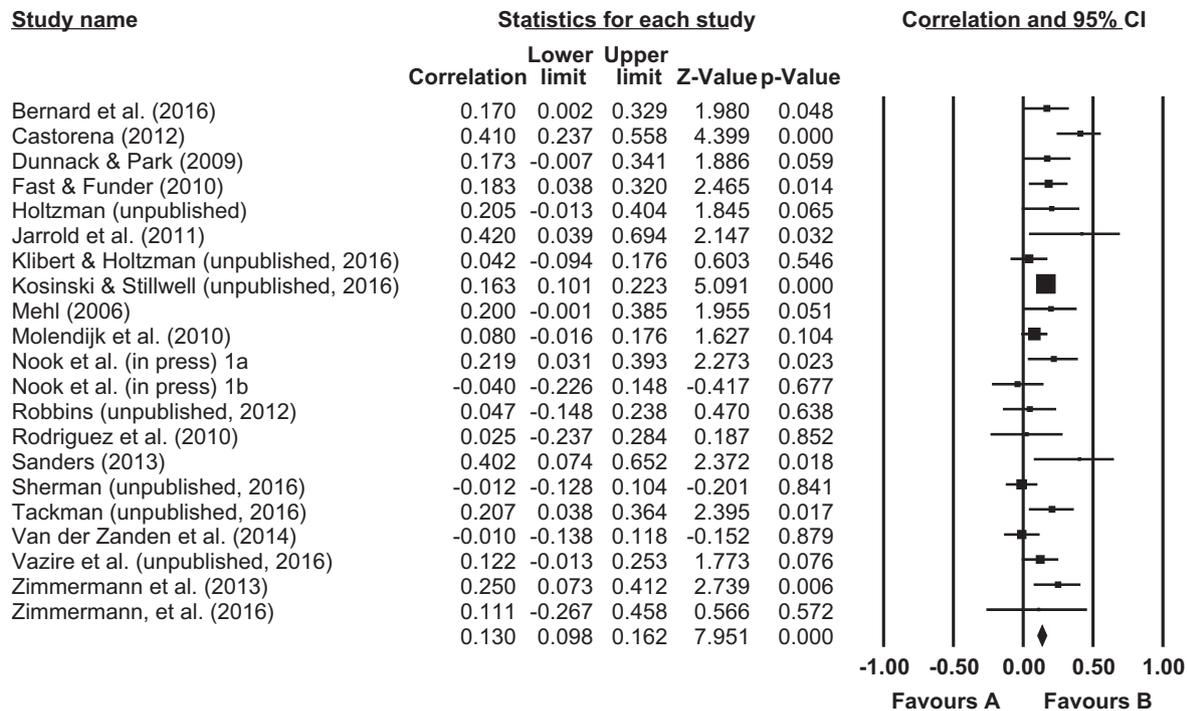
tions which were collapsed, leaving one effect size for the study. Molendijk et al. (2010) provided correlations for patients ( $r = 0.07$ ) and controls ( $r = 0.11$ ) separately and thus were combined. Rodriguez et al. (2010) reported correlations for personal diary entries ( $r = 0.15$ ) and online blog writing ( $r = -0.10$ ) and thus were combined. Zimmermann et al. (2016) reported two correlations: the first one was between depression and subjective first person singular (e.g. "I";  $r = 0.04$ ) and the second was between (a) depression and objective first person singular (e.g. "me") and (b) possessive first person singular (e.g. "my") together ( $r = 0.18$ ). In order to obtain one effect for the study, the correlations were averaged into a final score.

### 1.4. Calculation of effect sizes

Having arrived at 21 separate correlations, we proceeded as follows: Following the instructions of Borenstein and colleagues (Borenstein, Hedges, Higgins, & Rothstein, 2009), the correlation magnitudes were converted to the Fisher's  $z$  score, averaged, and the converted back to the correlation metric. Unless explicitly noted, we report the findings from the fixed effects model. To do this, we used the software called Comprehensive meta-Analysis, Version 3 (Borenstein, Hedges, Higgins, & Rothstein, 2016, [www.meta-analysis.com](http://www.meta-analysis.com)) and the metafor package for R (Viechtbauer, 2010).

## 2. Results

The results can be seen in Fig. 1. Using the fixed effects model, the mean effect size was  $r = 0.130$  (95% CI = 0.098–0.162) indicating that there was a positive relationship between depression and first person singular pronoun use,  $p < 0.001$ ; the  $I^2$  was 47.985. (The random effects model produced similar results:  $r = 0.138$  [95% CI = 0.089–0.186],  $p < 0.001$ .) Thus, it appears that the effect is real.



**Fig. 1.** Results of the meta-analysis. The correlation on the bottom row indicates the overall effect ( $r = 0.130$ ,  $p < 0.001$ ). (See above-mentioned references for further information.)

There was significant variability among the effects,  $Q(20) = 38.45$ ,  $p = 0.008$ , and thus we aimed to model this variability. First, we conducted an exploratory analysis using mean age of participants as a moderator for the 19 studies for which mean age was reported (the two that did not report age were [Fast and Funder \(2010\)](#) and [Dunnack and Park \(2009\)](#)); the simultaneous test that the coefficient was zero was not significant,  $Q(1) = 1.53$ ,  $p = 0.21$ ; this indicates that the effect is similar across different ages. We also tested gender as a moderator based on 1817 (1164 women; 653 men) participants from 14 of the studies for which we obtained correlations specific to each gender; contrary to expectation ([Fast & Funder, 2010](#)), the moderator was not significant,  $Q(1) = 0.34$ ,  $p = 0.556$ . The unweighted correlations were 0.096 for men and 0.126 for women. Additionally, we tested the hypothesis that clinical samples exhibited a different effect than non-clinical samples; this analysis was not statistically significant,  $Q(1) = 1.94$ ,  $p = 0.163$ . Next, we tested the possibility that there was a difference in the effect size depending on whether the language was written or spoken (e.g., into a recorder); the moderator was not significant,  $Q(1) = 0.82$ ,  $p = 0.366$ . We also tested the possibility that the language tasks that were anonymous (private) were more indicative of depression than language tasks that were with another person (public); contrary to expectation ([Rodriguez et al., 2010](#)), the moderator was not significant,  $Q(1) = 0.38$ ,  $p = 0.540$ , although the private ones ( $r = 0.138$ ) were nominally more reflective of depression than the public ones ( $r = 0.119$ ). In sum, none of the moderation analyses we ran were significant.

Last but not least, we ran some key tests of publication bias. We tested whether the effects differed between those studies that were published and those that were unpublished; the effect was not significant,  $Q(1) = 1.16$ ,  $p = 0.281$ , indicating no evidence for publication bias. The funnel plot for the effects is shown in [Fig. 2](#). Additionally, we ran a regression test ([Egger, Smith, Schneider, & Minder, 1997](#)) to determine whether the standard errors were associated with the effect sizes; a significant effect here would indicate that the funnel plot is asymmetrical and thus would sug-

gest that publication bias is present. The effect was not significant,  $z = 1.560$ ,  $p = 0.119$ . Thus, several tests were consistent in showing a lack of publication bias in this literature.

### 3. Discussion

Judged by current standards ([Hemphill, 2003](#)), we found a small positive correlation between first person singular pronoun use and depression. This more firmly establishes what has been called a fundamental correlate in the literature on language markers of individual differences ([Ireland & Mehl, 2014](#)). It is worth considering what the determined effect size ( $r = 0.13$ ) means in this literature. A benchmark would be useful: In one of the largest studies of its kind to date, none of the linguistic correlates of Big 5 personality traits yielded larger effects—that is,  $|r| > 0.125$  ([Kern et al., 2014](#)). As another benchmark, Schwartz and colleagues found a few similar effects for some of the Big 5 personality traits ([Schwartz et al., 2013](#)); for instance, the intuitive link between swear words and agreeableness was comparable in magnitude ( $\beta = -0.15$ ). Thus, albeit “small” ([Hemphill, 2003](#)), the link between first-person singular pronoun use and depression is arguably one of the more robust effects linking a linguistic marker to a major individual difference (for a discussion of effect sizes in meta-analyses, see: [Rosenthal, 1991](#)). It is also important to note that this effect is not just a function of publication bias; we established that the effect is robust in the unpublished literature as well.

In terms of theory, our primary finding is consistent with the idea that people who are depressed tend to perseverate about themselves ([Pyszczynski & Greenberg, 1987](#)). This bodes modestly well for assessment using personal pronouns as a linguistic marker of depression, and it may serve as the basis for treatment development. Future research should attempt to isolate and manipulate first-person singular pronoun use and see if that impacts levels of (state) depression ([Fenigstein & Levine, 1984](#); [Pyszczynski, Hamilton, Herring, & Greenberg, 1989](#)).

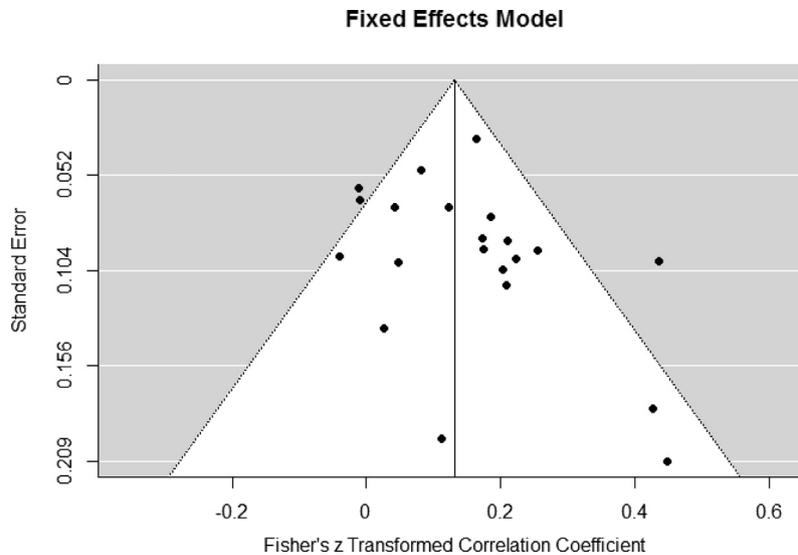


Fig. 2. Funnel plot for the fixed effects model.

Our moderator analyses suggest that the effect is robust across different demographic characteristics (i.e., age and gender). This meta-analytic finding was unexpected given that previous research in single studies had found differences in the correlation based to demographic characteristics, most notably gender (Fast and Funder, 2010). Nolen-Hoeksema in particular argued that the link between rumination and depression is stronger for females than it is for males (for review, see: Lyubomirsky et al., 2015; Nolen-Hoeksema et al., 1999). Now, if one does not believe that first person singular pronoun use is a valid indicator of self-focused rumination, then these results are of little consequence for Nolen-Hoeksema's argument. However, to the extent that first person singular pronoun use is a valid indicator of self-focused rumination, this meta-analysis does not support the idea that the rumination-depression link is significantly greater for women than for men; that is, in our sample of studies, men who used first-person singular pronouns with some frequency were approximately just as likely to be depressed as women who used first-person singular pronouns with some frequency. In one sense, this finding is promising in that it suggests that first person singular pronoun use is a reliable marker of depression in both genders. The other moderator analyses yielded little to no evidence that this effect varies according to demographic characteristics or task characteristics. Therefore, the effect seems to be robust across these various features.

In conclusion, this research has clear implications for theory, identification, assessment, and treatment. In terms of theory, the notion that self-focus is central to depression receives some modest support. In terms of identification and assessment, we can conclude that indeed first person singular pronouns are a modest linguistic marker of depression. In terms of treatment, this meta-analysis provides confidence in the estimate of the effect size, such that cutting edge research on linguistic strategies to cope with depression are more informed (Kross & Ayduk, 2008, 2011; Kross et al., 2014; Zimmermann et al., 2016). Ultimately, our hope is that this research contributes to depression being better understood, identified, assessed, and treated.

#### Author note

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